3.18 Public Health and Safety

This section includes information regarding public health and safety and hazardous materials that pertain to the area of the proposed Project. Electric transmission projects may affect public health and safety during construction and operation. Potential health and safety concerns related to power transmission during construction include worker injuries, exposure to hazardous materials, contaminated sites, or excessive noise, and other risks to workers and the surrounding community from accidents that could occur within the proposed analysis area. Health and safety concerns associated with operations include electrical shock, electric and magnetic fields, corona, stray and induced voltage, collision hazards, fire risk, and public access to transmission structures and substation equipment. Worker safety issues are associated with Project construction, operation, and maintenance activities.

Transportation-related safety issues include highway and roadway safety associated with the transport of structures, structure hardware, conductors, and employees, as well as hazards associated with proximity to airports or military operation areas. These issues are addressed in Section 3.16, Transportation and Access.

As with any U.S. energy infrastructure, the proposed transmission line could be the target of terrorist attacks or sabotage. Potential impacts from a sabotage or terrorism event are evaluated by analyzing the outcome of catastrophic events such as major and minor transmission line failures or accidents without determining the motivation behind the incident. Thus, such outcomes could be representative of the impacts from a sabotage or terrorism event. The level of risk is estimated based on the current conceptual design of the transmission line, applicable health, safety, and spill prevention regulations, and expected operating procedures.

3.18.1 Regulatory Background

The Project crosses many jurisdictions including federal lands managed by the USFS, BLM, NPS, DOE, DOD, and Bureau of Reclamation, state land, and county and city lands. Depending on the specific location, a number of public health and safety regulations may be applicable to various portions of the Project. OSHA (U.S. Department of Labor) has jurisdiction over most occupational health and safety issues within each state the Project crosses. Industrial construction and routine workplace operations are governed by the OSHA of 1970, particularly 29 CFR 1910 (general industry standards) and 29 CFR 1926 (construction industry standards). While there are no federal noise regulations, federal agencies, states, municipalities and local governments may adopt laws and regulations that impose a maximum noise limit or mitigation requirement within their jurisdiction. These ordinances are often enforced by police or an agency.

“Hazardous materials,” which are defined in various ways under a number of regulatory programs, can represent potential threats to both human health and the environment when not properly managed. The term “hazardous materials” includes the following materials that may be utilized or disposed of in construction and operation:

- Substances covered under Occupational Health and Safety Administration Hazard Communication Standards (29 CFR 1910.1200 and 30 CFR 42).
- “Hazardous materials” as defined under USDOT regulations at 49 CFR, Parts 170-177: The types of materials that may be used in construction and operational activities that would be subject to these regulations would include sodium cyanide, explosives, cement, fuels, some paints and coatings, and other chemical products.
- “Hazardous substances” as defined by the CERCLA of 1980 and listed in 40 CFR Table 302.4: The types of materials that may contain hazardous substances that would be subject to these requirements would include solvent-containing materials (e.g., paints, coatings, and degreasers); acids; and other chemical products.

- "Hazardous wastes" as defined in the Resource Conservation and Recovery Act: Procedures in 40 CFR 262 are used to determine whether a waste is a hazardous waste. Hazardous wastes are regulated under Subtitle C of RCRA.
- Any "hazardous substances" and "extremely hazardous substances," as well as petroleum products such as gasoline, diesel, or propane, that are subject to reporting requirements if volumes on-hand exceed threshold planning quantities under Sections 311 and 312 of Superfund Amendments and Reauthorization Act. The types of materials that may be used in construction and operational activities that could be subject to these requirements would include fuels, coolants, acids, and solvent-containing products such as paints and coatings.
- Oil products, defined as "oil" in the SPCC regulations of 40 CFR 112: The types of materials that would be subject to these requirements include mineral oil, fuels, lubricants, hydraulic oil, and transmission fluids.

In conjunction with the definitions noted above, the following lists provide information regarding management requirements during transportation, storage, and use of particular hazardous chemicals, substances, or materials:

- The Superfund Amendments and Reauthorization Act Title III List of Lists or the Consolidated List of Chemicals Subject to Emergency Planning and Community Right-to-Know Act and Section 112(r) of the CAA.
- The USDOT listing of hazardous materials in 49 CFR 172.101.

Certain types of materials, while they may contain potentially hazardous constituents, are specifically exempt from regulation as hazardous wastes. Other wastes that might otherwise be classified as hazardous can be managed as "universal wastes" and are exempted from hazardous waste regulations as long as those materials are handled in ways specifically defined by regulation.

3.18.2 Analysis Area

For the purposes of public health and safety, the Project analysis area encompasses locations in which the transmission line and associated road or temporary work areas may be located, which are generally confined to within 1 mile of each side of the alternative alignments (as represented by the Draft EIS refined transmission corridor).

3.18.3 Occupational Safety

Worker safety in construction and industrial settings is regulated by OSHA at the federal level. Wyoming, Utah, and Nevada manage and enforce their own workplace safety programs, which incorporate OSHA regulations and add other requirements. The proposed Project would be subject to OSHA and state standards during construction and operations (e.g., OSHA General Industry Standards [29 CFR 1910] and the OSHA Construction Industry Standards [29 CFR 1926]). OSHA standards are designed to protect workers from potential construction and industrial accidents, as well as to minimize exposure to workplace hazards (e.g., noise, chemicals). **Table 3.18-1** summarizes national safety statistics for the year 2010 from the Bureau of Labor Statistics (BLS) for industry categories that are relevant to the proposed Project.

From 2003 to 2007, the most common causes of fatalities were transportation accidents (36 percent), followed by assaults and violent acts (15 percent) and falls (14 percent). Worker contact with electric current in some shape or form was responsible for 4 percent of fatal workplace accidents. Worker contact with overhead power lines was the cause of on-the-job electrical deaths in 45 percent of all occupational electrical fatalities (Electrical Safety Foundation International 2010).

Table 3.18-1 2010 National Statistics for Workplace Hazards

Industry	Nonfatal Recordable Incidents (Per 100 Full-time Equivalent Workers)	Lost Workdays (Per 100 Full-time Equivalent Workers)	Fatalities (Per 100,000 Full-time Equivalent Workers)*
Construction	4.0	2.1	9.0
Utilities (electric power generation, transmission, control, and distribution)	3.1	1.7	2.5

Sources: BLS 2010a-c.

The 2010 injury rate for the state of Utah was not statistically different from the national rate. Wyoming and Nevada had injury rates statistically greater than the rest of the country. State injury rates were not available for Colorado (BLS 2010a). Worker safety issues are a concern during all phases of the Project.

3.18.4 Electromagnetic Fields, Corona, and Stray Voltage

EMFs are produced by voltage (i.e., the electrical pressure that drives an electric current through a circuit). Magnetic fields are produced by current, which is defined as the movement or flow of electricity. The earth has both magnetic fields produced by currents of highly conductive iron contained within the molten core of the planet and an electric field produced by the electric potential differences between the land's surface (negatively charged) and the atmosphere (positively charged). Electric fields occur naturally, radiating from the earth's core to the atmosphere. These electrical fields dissipate with elevation. For example, there is a difference of approximately 200 volts between the electric field at a person's head compared to a person's feet (Carlson 1999). While electrical fields can be easily shielded or reduced by walls and other objects, magnetic fields are not and they are more likely to penetrate into the body.

EMFs are present wherever electricity is used, such as in household appliances, cell phones, wristwatches, lamps, computers, and transmission lines. The electric-field strength from wiring and appliances located within homes is typically less than 0.01-kV/m, while greater field strength can be found very close to some appliances, such as electric blankets. Typical homes produce background magnetic field levels (away from appliances and wiring) that range from 0.5 milliGaus (mG) to 4 mG, with an average value of 0.9 mG.

High voltage DC and AC power lines produce different types of EMFs. An AC power line alternates at a rate of 50 to 60 times a second (Hz), while a DC power line produces a static electric field that does not alternate. Static electric fields, such as those produced from DC power lines, are encountered naturally in the everyday environment such as when walking across carpet on a dry day (Bailey et al. 1997). Static electric fields can be blocked by trees, bushes, and any conducting building material. There are no federal standards or standards from affected states limiting occupational or residential exposure to power line EMFs; however, the International Committee on Nonionizing Radiation Protection (ICNIRP) has set a voluntary protection level for electrical fields for the general public of 4.2-kV/m (ICNIRP 2009). The results of the few static electric studies that have been conducted indicate that the only effects are associated with body hair movement and discomfort from spark discharges (World Health Organization [WHO] 2006). The recommended maximum static magnetic field exposure value from the WHO is 200,000 mG during the working day for occupational exposure (WHO 2006). The natural magnetic field varies from 350 to 700 mG. Magnetic fields from man-made devices that use DC, such as electric trains and some industrial equipment, can be up to 1,000 times as strong as what is produced naturally. Medical devices such as MRIs can produce magnetic fields up to 100,000 times stronger than the naturally occurring magnetic field (Exponent 2011). Both electric and magnetic fields diminish rapidly between 50 to 100 feet from the source and are insignificant at distances more than 100 feet (Exponent 2011).

It has been suggested that a connection may exist between EMFs and various forms of cancer (WHO 2011). However, there have been mixed and often conflicting opinions regarding health effects related to EMF exposure. Human exposure to a 60-Hz magnetic field from alternating current involves a current density that is approximately 1,000 times less than naturally occurring currents (National Research Council [NRC] 1997). Additionally, human exposure to the magnetic field from high capacity direct current power lines is the same or less than the naturally occurring magnetic field (TransWest 2011). While some studies have linked EMF to increased incidence of childhood leukemia, central nervous disorders, and adult cancers (including leukemia), the results have not been reproducible or conclusive (National Institute of Health 2005, 1998). The National Research Council evaluated the published literature on EMF and found a statistical relationship between residential wiring codes and an increased incidence of childhood leukemia, but there was no correlation between measured magnetic fields and incident rates of childhood leukemia (NRC 1997). Further, there is no known mechanism for EMF to cause disease (NRC 1997). Other studies have failed to indicate a correlation between disease and exposure levels or exposure duration. There is no consistent or conclusive evidence linking exposure to EMF from electrical transmission lines to human disease (National Institute of Health 2005; NRC 1997).

Corona, a luminous electrical discharge from a transmission line, is caused by electric current arcing across two or more points along transmission line conductors. It can be seen as bluish tufts or streamers surrounding the conductor and generally, a hissing sound can be heard. Transmission line corona varies with atmospheric conditions and is more intense during wet weather. Corona on the surface of high voltage conductors can create signals that may interfere with radio and television reception, but this can be minimized with modern transmission line design.

It has been hypothesized that corona creates ions that can be dispersed by winds, inhaled and deposited on the skin and in the lungs, and lead to adverse human effects (Fews et al. 1999). The Independent Advisory Group on Non-ionizing Radiation (National Radiological Protection Board 2004) concluded that:

> *"…it seems unlikely that corona ions would have more than a small effect on the long-term health risks associated with particulate air pollutants, even in the individuals who are most affected. In public health terms, the proportionate impact will be even lower because only a small fraction of the general population live or work close to sources of corona ions."*

Subsequent reviews have reaffirmed the lack of correlation between exposure to EMF or corona ions and adverse health effects (Energy Network Association 2009; WHO 2007).

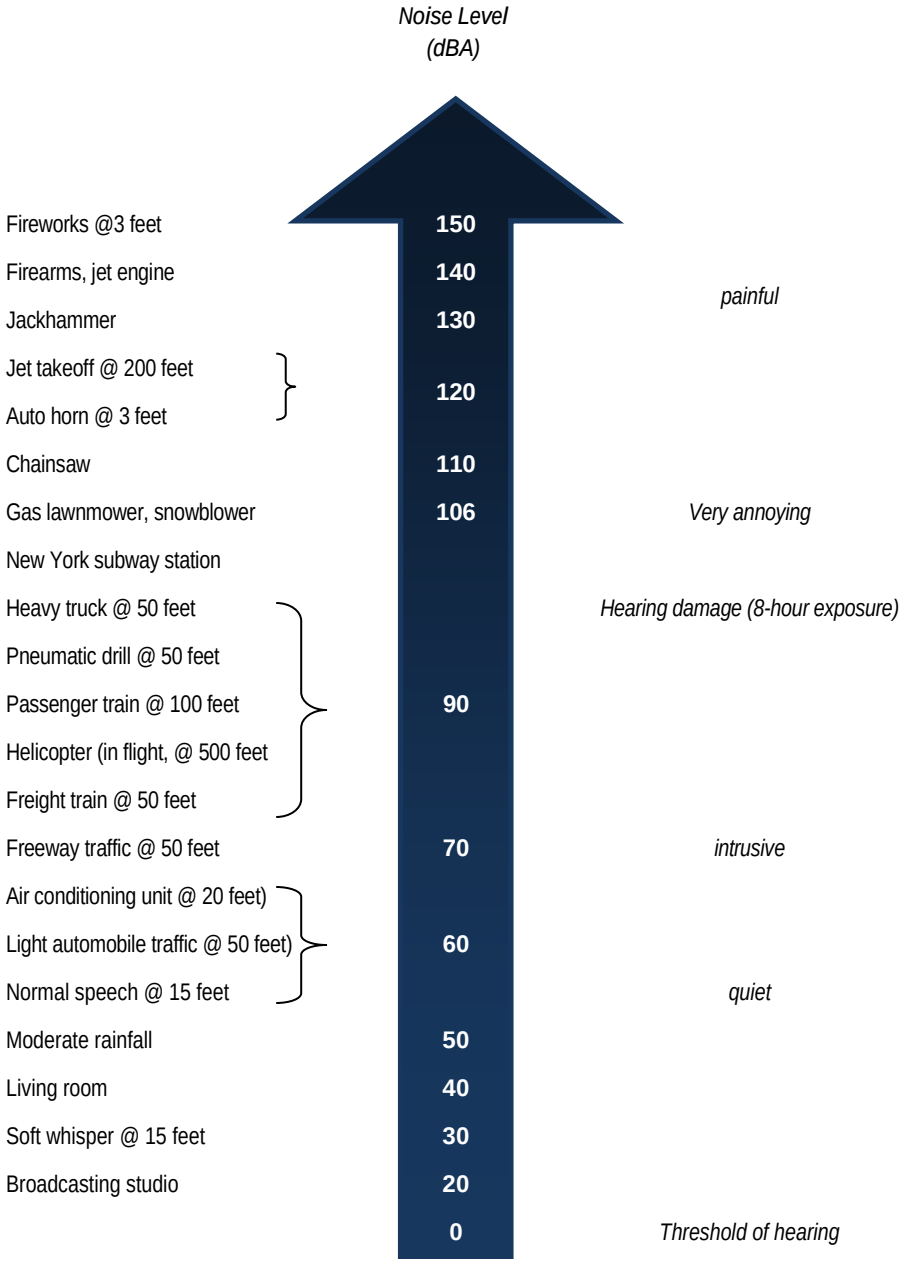
Stray voltage is typically associated with rural end-users, such as farm and ranch complexes where equipment is exposed to dust and other contaminants. Induced current occurs along linear features, such as fences that parallel conductors, and typically can be minimized with adequate grounding. As a result of their static nature, DC lines do not induce currents and voltages. In contrast, as a result of their alternating nature, AC electric fields can induce currents and voltages in nearby conductive objects.

3.18.5 Noise

Noise is defined as any sound that is undesired, extraneous or interferes with one's hearing. Noise is considered a human health concern as it can interfere with speech communication and hearing or is otherwise considered annoying. The term "unwanted" can be subjective in nature and can vary greatly among individuals. An individual's response to noise is influenced by the type of noise, perceived importance of the noise, appropriateness in the setting, time of day, type of activity during which the noise occurs, and the sensitivity of the individual.

Sound is measured in dBA and is based on a logarithmic scale to account for the wide range of audible sound intensities. Under the logarithmic scale for sound (and noise), a 10-dBA increase would increase

sound intensity by 10 times; a 20-dBA increase would increase sound intensity by 100 times. As a result, methods have been developed for weighting the sound frequency spectrum to approximate the response of the human ear. The dBA scale is widely used for environmental noise assessments because of its relative convenience and accuracy in correlating with people's judgments of what constitutes noise. Typical A-weighted sound and noise levels associated with common activities or situations are shown in **Figure 3.18-1**.



Sources: CEQ 1970.

Figure 3.18-1 Typical A-weighted Sound Levels

Ambient noise, or background noise, is defined as the total noise from nearby and distant sources, that is relatively steady and homogeneous, with no particular source identifiable within it (GE Energy 2005;

National Wind Coordinating Committee 2002). Ambient noise levels within the 2-mile Project corridor have not been measured; however, as rural background noise in wilderness and rural areas typically is 40 dBA (USEPA 1978), they are likely to be similar in magnitude. Levels near developed areas and along area roads and highways are likely to be higher due to vehicle movement and other human activities. Wind is frequently a major contributor to ambient noise levels within the analysis area, as well as agricultural machinery noise when operated near residences and other sensitive receptors. Sensitive receptors within the area are limited to residents in scattered rural locations as well as low population urban areas.

Noise level from a line source such as a power line will decrease by 3 dBA for every doubling of the distance away from the source (Truax 1999). This concept is known as cylindrical spreading. Noise level from a point source such as concentrated construction activity will decrease by 6 dBA for every doubling of the distance away from the source (Truax 1999). This concept is known as geometric spreading, and is based on the inverse square law. This law states that the intensity of the influence at any given radius is the source strength divided by the area of the sphere. The energy twice as far from the source is spread over four times the area, hence the sharp drop off in intensity. Sound intensity follows the inverse square law assuming there are no reflections or reverberations. **Table 3.18-2** displays the human perception of a change in decibel levels.

Table 3.18-2 Human Perception of Noise Level Changes

Change in Decibel Level	Result
1 dBA	Insignificant
3 dBA	Barely discernible
5 dBA	Noticeable community response
10 dBA	Causes an adverse community response

As shown above, when comparing similar sounds (e.g., changes in traffic noise levels) a 3-dBA change in sound-pressure level is considered detectable by the human ear in most situations. A 5-dBA change is readily noticeable by most people and a 10-dBA change is perceived to be a doubling (or halving) of sound or noise. Impacts to wildlife from noise are addressed in Section 3.7, Wildlife, and Section 3.8, Special Status Wildlife Species.

3.18.6 Hazardous Materials and Waste

3.18.6.1 Hazardous Materials

A number of hazardous substances are used in the construction, operation, and maintenance of electrical transmission lines. **Table 3.18-3** lists common types of materials that could be used, but is not a comprehensive list. Significant generation of hazardous waste is not anticipated.

Table 3.18-3 Hazardous Materials Typically Used for Transmission Line Construction

2-cycle oil (contains distillates and hydrotreated heavy paraffinic)	Gasoline treatment
ABC fire extinguisher	Hot stick cleaner (cloth treated with polydimethylsiloxane)
Acetylene gas	Hydraulic fluid
Air tool oil	Insulating oil (inhibited, non-PCB)
Ammonium hydroxide	Lubricating grease
Antifreeze (ethylene glycol)	Mastic coating
Automatic transmission fluid	Methyl alcohol
Battery acid (in vehicles and in the meter house of the substations)	Motor oils
Bottled oxygen	Paint thinner

Table 3.18-3 Hazardous Materials Typically Used for Transmission Line Construction

Brake fluid	Pesticide
Canned spray paint	Propane
Chain lubricant (contains methylene chloride)	Puncture seal tire inflator
Connector grease (penotox)	Safety fuses
Contact Cleaner 2000	Starter fluid
Diesel deicer	Sulfur hexaflouride (within the circuit breakers in the substations)
Diesel fuel	1,1,1 trichloroethene
Diesel fuel additive	WD-40 (penetrating oil)
Gasoline	

Sources: San Diego Gas and Electric 2006.

3.18.6.2 Solid Waste

Solid waste generated from transmission line construction is minimal when compared to other types of industrial and commercial construction projects. Solid waste generated from construction and operation of the proposed transmission line and substations would generally consist of construction rubble (e.g., excess or off-spec concrete, soil, and rock), paper, cardboard, packing material, brush, other vegetation, and scrap metal (San Diego Gas and Electric 2006).

3.18.6.3 Existing Contaminated Sites

Exposure to certain chemicals can adversely affect human health through toxic reactions, carcinogenic effects, or both. Chemical exposure can occur from chemicals present in water or in soil from past industrial activities. Contaminated sites can result from industrial activities (mineral extraction, mineral processing and general manufacturing) or from commercial activities (fuel storage for retail outlets, vehicle maintenance). Active or closed landfills or unauthorized dumps also may present potential for exposure.

There are no known contaminated sites along the proposed route; however, despite the predominantly rural landscapes crossed by the proposed Project, contaminated sites may be encountered or discovered during construction, given that the proposed routes often parallel (or are within) existing utility and transportation corridors or are in areas with current or historic oil and gas production. No Phase I Environmental Site Assessments have been conducted for the proposed route.

3.18.7 Impacts to Public Health and Safety, Hazardous Materials

The impact analysis area for public health and safety is defined as the area in which the transmission line and associated road or temporary work areas may be located, which generally are confined to within 1 mile on each side of the alternative alignments (as represented by the Draft EIS refined transmission corridor). Potential impacts associated with public health and safety, such as construction injuries to project personnel, EMFs, corona effects, stray and induced voltage, noise, and hazardous materials are evaluated for the impact analysis area.

The methodology for evaluating impacts on public health and safety involves identifying and assessing design, construction, and operational standards and guidelines for electric transmission lines; determining the proximity of populated areas and structures to the proposed Project; and calculating the proximity of communication sites and co-located pipelines to the analysis area. Communication sites were analyzed to assess the probability of communication disturbances caused by corona. The potential effects of EMFs from AC power lines on co-located pipelines are discussed in Section 3.18.7.2.

The following impact parameters have been used for this analysis:

- Number of communities, sensitive receptors, and RAs within the refined transmission corridor;
- Number of residences, commercial/industrial buildings, agricultural buildings, and outbuildings within 500 feet and 200 feet of the alignment;
- Number of non-project related communication sites within the analysis area. Communication sites may include, but are not limited to, AM, FM, cellular, television, and microwave sites; and
- Potential for accidental release of hazardous materials during construction and operation.

Impact parameters were used in combination with effects information for the purpose of quantifying impacts. The impact parameters also allow comparisons among alternatives or alternative variations. Impact issues and the analysis considerations for public health and safety are listed in **Table 3.18-4**.

Table 3.18-4 Relevant Analysis Considerations for Public Health and Safety, Hazardous and Materials

Resource Topic	Analysis Considerations and Relevant Assumptions
Serious injuries to workers and the public at large.	The analysis evaluates potential construction and operation impacts to the health and safety of workers.
Adverse health impacts from EMFs, stray voltage and induced voltage associated with transmission lines.	The analysis evaluates direct effects on communities and sensitive receptors from potential adverse impacts from electric transmission.
Noise impacts to nearby communities and residences.	The analysis evaluates the potential for noise impacts on nearby communities, residences, and other noise sensitive receptors.
Impacts from accidental release of hazardous materials.	The analysis evaluates potential impacts from the accidental release of hazardous materials.

3.18.7.1 Impacts from Terminal Construction and Operation

The Northern and Southern terminals would be constructed regardless of alternative route or design option.

Northern Terminal

The Northern Terminal would be sited on private lands near Sinclair, Wyoming and would require an initial disturbance of 519 acres for construction and a permanent disturbance of 249 acres for operation.

There are no residences, communities, parks or developed RAs within 1 mile of the proposed terminal site; however, there are 3 communication sites within 1 mile of the proposed terminal site. There is a federal prison located more than 2 miles from the terminal site. There are no other sensitive receptors located within 1 mile of the terminal site. There are no structures within 500 feet of the terminal site. The lack of sensitive receptors and structures near the terminal site would result in no impacts from noise and EMF. Further analysis is provided in the subsections below.

Occupational Safety

During construction of the Northern Terminal, workers would be at risk of injury from use of heavy equipment, working at heights, working in the vicinity of high voltage equipment, as well as from typical hazards found on a construction site. Based on BLS data from 2010, there are four construction-related non-fatal recordable incidents per 100 full-time equivalent workers per year. Based on an average construction work force of approximately 400 workers, it is estimated there would be 16 non-fatal recordable incidents annually.

To minimize hazards to construction workers that may result in injuries that meet or exceed the BLS threshold, workers would follow the NESC, U.S. Department of Labor requirements, and OSHA/State safety standards, as well as Project-specific safety requirements (TWE-51). A health and safety plan also would be implemented to protect workers and the public during construction (TWE-56).

Through the implementation of TWE-51 and TWE-56, as well as adherence to applicable safety standards, minimal impacts to worker safety are anticipated from terminal construction.

During operations, there would be risk for injuries to maintenance and contract workers. To minimize risk, safety measures would be taken that include following the NESC, U.S. Department of Labor requirements, and OSHA/State safety standards, as well as providing appropriate training to all pertinent personnel. To reduce the risk of fire, fire protection staff would be located at the Terminal. Safety and security lighting, as well as security fencing, also would be installed. Security staff would consist of support operations and maintenance workers located at the Terminal.

Through adherence to applicable OSHA safety standards, as well as the installation of security lighting and fencing, minimal to no impacts to worker safety are anticipated from operations.

Fire Risk

Construction and operation activities associated with the Northern Terminal that could be sources of ignition include welding, blasting, blading, small-engine use, OHV, and vehicle traffic over vegetated areas, and parking vehicles in areas of tall, dry grass. Impacts on fire risk would be proportional to the increased surface disturbance and increases in the sources of ignition.

To minimize the incidence of injuries due to fire during construction and operation, a Fire Protection Plan would be implemented (TWE-64). Components of this plan include, but are not limited to, the requirement for work vehicles to carry shovels, water, and fire extinguishers; all vehicles would be restricted to travel on designated roads; vehicles would be parked in areas free of vegetation; and welding, grinding, or cutting activities only would be conducted in areas cleared of vegetation. Section 3.21, Wildland Fire, includes additional mitigations to further reduce risk including the additions of stipulations to the Fire Protection Plan (FR-1); restrictions against open trash burning (FR-2); restrictions limiting spark-generating activities such as refueling, smoking, and welding) to cleared areas along with the use of a spotter for welding and similar activities (FR-3); and requirements for approved spark arrestors in all engines (FR-4)

Through the implementation of TWE-64 and these additional mitigations, impacts to public health and safety as a result of fire are not expected.

Noise

Other health effects to construction workers and the public in the vicinity of the terminal area would include increased noise levels from heavy construction machinery and construction activities, as well as light vehicle construction traffic. Average noise levels for typical construction equipment range from 74 dBA for a roller to 88 dBA for a crane (Harris, Miller, Miller, and Hanson, Inc. 2006). In general, the dominant noise source from most construction equipment is the diesel engine, particularly if the engine is poorly muffled. Other sources of continuous noise include field compressors, bulldozers, and backhoes. **Table 3.18-5** portrays the noise levels of various types of construction equipment expected at different distances.

For a general assessment of construction impacts, assuming a geometric spreading only (i.e., a decrease of about 6 dBA per doubling of distance from a point source) on the basis of the noise levels presented in **Table 3.18-5**, it is estimated that the noisiest piece of equipment operating at peak load would produce noise levels that would exceed the USEPA guideline for residential noise (55 dBA) at a distance of about 1,600 feet (USEPA 1974). Rural background noise in wilderness and rural areas is

typically near 40 dBA (USEPA 1978). The effects of noise generated by construction would be alleviated, to some extent, by air absorption, terrain, and vegetation.

Table 3.18-5 Noise Levels at Various Distances from Typical Construction Equipment

Construction Equipment	Noise Level[1] at Distances (dBA)					
	50 feet	100 feet	200 feet	400 feet	800 feet	1,600 feet
Bulldozer	85	79	73	67	61	55
Concrete Mixer	85	79	73	67	61	55
Concrete Pump	82	76	70	64	58	52
Crane, Derrick	88	82	76	70	64	58
Crane, Mobile	83	77	71	65	59	53
Front-end Loader	85	79	73	67	61	55
Generator	81	75	69	63	57	51
Grader	85	79	73	67	61	55
Shovel	82	76	70	64	58	52
Truck	88	82	76	70	64	58

[1] The equivalent steady-state sound level that contains the same varying sound level during a 1-hour period.

Sources: Harris, Miller, Miller, and Hanson, Inc. 2006.

BMPs to reduce the impacts of noise are: NOISE-1 (limit noisy construction activities [including blasting] to the least noise-sensitive times of day [i.e., daytime only between 7 am and 10 pm]) and NOISE-2 (ensure that all equipment has sound-control devices no less effective than those provided on the original equipment). Also, a Blasting Plan, which would identify methods and measures to minimize the effects of blasting, would be implemented (TWE-53). While noise levels at 55 dBA would be approximately 15 dBA higher than the ambient rural noise level, this would not be a permanent increase, but an impact that would end once construction ceases (approximately 2.1 years project-wide, but a much shorter duration in localized areas). Construction activities at terminal locations would take place over a 27- to 28-month timeframe, occurring on a year-round basis.

Noise during the operations phase would consist mainly of traffic, and would range from light- to medium-duty vehicles, and is expected to be negligible. Overall, the noise level of operations would be lower than the noise level associated with short-term sporadic and temporary construction activities, and in conjunction with the existing ambient noise, would result in negligible impact to noise sensitive receptors in the analysis area.

As a result of the potential risk of noise exceeding USEPA guidelines during construction, the mitigation measure below is recommended in addition to the proposed design features and BMPs.

***PH-1**: Develop, implement, and maintain a noise complaint reporting and review process to deal with potential queries and issues as they arise. This would include a toll-free telephone number for receiving question or complaints during Project construction and a public liaison person before and during Project construction to respond to concerns over noise.*

Only minor impacts to noise sensitive receptors due to construction are anticipated due to the implementation of TWE-53, BMPs NOISE-1 and NOISE-2, the proposed mitigation measure **PH-1**, and the remote and rural project location.

EMF, Corona, Stray and Induced Voltage

Impacts from EMFs, corona, and stray and induced voltage during operations are expected to be minimal due to the lack of communities, areas of public gathering, and recreation sites within 1 mile of the Northern Terminal areas. Impacts from corona are expected to be minimal due to the lack of communities, areas of public gathering, and recreation sites within 1 mile of the Northern Terminal areas. Although current research studies do not provide consistent or conclusive evidence linking exposure to EMF from electrical transmission lines to human disease TWE will continue to monitor research on audible noise and EMF to ascertain whether these effects are significant (TWE-54). Furthermore, necessary measures would be applied to eliminate effects related to induced currents and voltages on conductive objects sharing the 250-foot-wide transmission line ROW (TWE-52). Implementation of TWE-49 and TWE-50 would reduce corona effects and noise. Design specifications include the use of materials designed to minimize radio and TV interference due to corona, as well as the use of regular surveillance patrols to identify and quickly repair any damaged insulators that may cause corona. In areas within the terminal where the AC transmission system could cause shock by electrostatic and electromagnetic AC induction, all buildings, fences, and other structures with metal surfaces located within 300 feet of the centerline would be grounded. All metal irrigation systems and fences that parallel the AC transmission line for distances of 500 feet or more and are within 300 feet of the centerline would be grounded. Additionally, all fences that cross under the AC transmission line also would be grounded (POD, **Appendix D**).

Minimal to no impacts to public health are anticipated from EMF, corona, or stray and induced voltage due to the implementation of TWE-49, TWE-50, TWE-52, and TWE-54, which are the measures indicated in the POD (**Appendix D**), as well as the remote nature of the terminal area and the lack of sensitive receptors and land uses such as communication sites, residences, and hospitals.

Hazardous Materials

Impacts related to the presence of hazardous materials could result with an accidental release of hazardous materials from transportation and use during construction. These impacts are often the result of improper handling or storage of hazardous materials. The environmental effects of a release would depend on the material released and the location of the release. Potential releases could include a small amount of fuel spilled during a transfer operation at the ROW to the loss of several thousand gallons of fuel into a riparian drainage. Impacts from spills would typically be minor because of the low frequency of spill occurrence, relatively low volume of materials being handled at any one time, and the small volume of spills. As part of the COM Plan, the applicant would prepare and provide a Spill Prevention, Notification, and Cleanup Plan (TWE-57). The Plan would include spill prevention measures, notification procedures and employee awareness training to reduce the potential of hazardous material releases or spills 100 feet from streams.

Impacts associated with the release or spill of hazardous materials to the environment or people during construction are expected to be minimal with the implementation of TWE-24 (which includes designated vehicle refueling zones located more than 100 feet from streams and wetlands) and TWE-57.

During construction, contaminated soil and/or groundwater (e.g., hydrocarbon contamination) could be encountered. Work would be suspended in the area of suspected contamination until the type and extent of contamination are determined. The specific procedures for handling the discovery of potentially contaminated soils would be described both in the Clean-up Work Management Plan (TWE-59) and the Hazardous Materials Management Plan (TWE-61) as part of the COM Plan. The Applicant and appropriate environmental agencies would be contacted as required by law (TWE-62).

Southern Terminal

The two options for the Southern Terminal would be sited near Boulder City, Nevada, and would require an initial disturbance of 557 acres for construction and a permanent disturbance of 226 acres for operation.

There are no residences, structures, communities or parks, or developed RAs within 1 mile of the proposed terminal sites, nor are there sensitive receptors located within 1 mile of the terminal sites; however, there are 2 communication sites within 1 mile of the terminal sites. The lack of sensitive receptors near the terminal sites would result in no impacts from noise and EMF.

During construction of the Southern Terminal, workers would be at risk of injury from use of heavy equipment, working at heights, working in the vicinity of high voltage equipment, as well as from typical hazards found on a construction site. Based on BLS data from 2010, there are four construction-related non-fatal recordable incidents per 100 full-time equivalent workers per year. Based on an average construction work force of approximately 500 workers, it is estimated there would be 20 non-fatal recordable incidents annually. In order to minimize hazards to construction workers that may result in injuries that meet or exceed the BLS threshold, workers would follow the NESC, U.S. Department of Labor requirements, and OSHA/State safety standards, as well as project-specific safety requirements (TWE-51). A health and safety plan also would be implemented to protect workers and the public during construction (TWE-56).

The same BMPs and design features used for the Northern Terminal would be implemented for construction and operation of the Southern Terminal, resulting in similar impacts to public health and safety.

The implementation of TWE-51, TWE-56, and TWE-64 and adherence to NESC, U.S. Department of Labor requirements, and OSHA/State safety standards would reduce or eliminate the risk of serious injuries. Only minor construction related impacts are anticipated due to the implementation of TWE-53, BMPs NOISE-1 and NOISE-2, and the proposed mitigation measure **PH-1**. Minimal to no impacts to public health are anticipated from EMF, corona, or stray and induced voltage due to the implementation of TWE-49, TWE-50, TWE-52, and TWE-54, the measures indicated in the POD (**Appendix D**), and the lack of sensitive receptors, residences, and hospitals. Impacts associated with the release or spill of hazardous materials to the environment or people during construction or discovery of contaminated soil or groundwater are expected to be minimal with the implementation of TWE-24, TWE-57, TWE-61, and TWE-62.

3.18.7.2 Impacts Common to all Alternative Routes and Associated Components

Potential effects of construction, operation, and decommissioning on public health and safety are discussed below for each of the resource issues listed in **Table 3.18-4**. After potential impacts are identified, relevant agency BMPs and design features are discussed in terms of reducing impacts. If impacts remain after application of BMPs and design features, additional mitigation is recommended to reduce impacts.

Construction Impacts

The same BMPs and design features used during terminal construction to reduce risk of occupational injury impacts from fire, or hazardous materials would be implemented for construction and operation of the alternative routes and associated components, resulting in similar impacts to public health and safety.

The implementation of TWE-51, TWE-56, and TWE-64, as well as adherence to NESC, U.S. Department of Labor requirements, and OSHA/State safety standards would reduce or eliminate the risk of serious injuries. As outlined in Section 3.18.7.1, additional mitigations is proposed to further reduce fire risk (FR-1, FR-2, FR-3, and FR-4; also see Section 3.21, Wildland Fire). Impacts associated with the release or spill of hazardous materials to the environment or people during construction or discovery of contaminated soil or groundwater are expected to be minimal with the implementation of TWE-24, TWE-57, TWE-61, and TWE-62.

Operation Impacts

The effects of operation of the Project would include potential EMF impacts on residences, sensitive receptors, nearby communities, and RAs. Additional potential impacts include lightning and corona effects on communication sites and effects of stray and induced voltage, noise, and fire on the health and safety of maintenance workers and the public. Most of the impacts associated with operation activities would be separate and unique from the types of effects discussed for construction activities.

Electrocution

The transmission lines would be operated according to the NESC and are designed to minimize the risk for shock (TWE-51). Therefore, the risk of electrocution during operation would be negligible. The shock a human or animal would receive by touching a metal object near a transmission line would be similar to that received after walking across carpet. Only maintenance and contract workers would be expected to be near the transmission lines. The public would be directly exposed to transmission lines if the lines were cut or otherwise downed; however the lines are designed to trip out of service (turn off). Transmission lines would be monitored and maintained so the likelihood of this event would be minimized.

Lightning

Potential adverse health effects associated with lightning strikes would be minimized by the presence of the overhead ground wire and optical ground wire that shield the conductors. The current from a lightning strike is diverted to the ground at the adjacent structure. When the current is discharged from the structure base to the surrounding ground, a step potential voltage can momentarily exist on the ground near the structure, presenting an electrocution hazard. Therefore, workers and the public should avoid structures during a lightning storm.

Through the implementation of TWE-51, impacts to public health and safety from electrocution and lightning during operations would not be expected.

Noise

During construction, increased noise levels from heavy construction machinery and construction activities, as well as light vehicle construction traffic would be similar to those discussed under Section 3.18.7.1. This would not be a permanent increase, but would be sporadic and temporary, ending once construction ceases (approximately 2.5 years project-wide, but much shorter in localized areas).

Potential power line noise during the operation phase can result from corona discharge, which is the electrical breakdown of air into charged particles. While hardly audible at the edge of the ROW in dry weather, water drops collecting on the lines in humid wet conditions provide favorable conditions for corona discharges. During a rainfall event, noise from corona discharge emanating from a power line would be at 39 dBA, at approximately 50 feet from the center of the tower. This would equal the noise being generated in a library (Bonneville Power Administration 1996). In general, because of the arid climate in the analysis area and existing ambient noise, such as wind and wildlife, the impact of corona noise is expected to be negligible. Noise from traffic during the operations phase would originate from light- to medium-duty vehicles, and is expected to be negligible. Overall, the noise levels of operations would be lower than the noise levels associated with short-term construction activities and, in conjunction with the existing ambient noise, would result in a negligible impact to noise sensitive receptors in the analysis area.

EMF, Corona, and Stray Voltage

High voltage DC transmission lines, as opposed to high voltage AC transmission lines, produce a constant static electric and magnetic field that decreases rapidly from the transmission line source. The natural geomagnetic field varies from 350 mG to 700 mG. Man-made devices that use DC, such as electric trains and some industrial equipment, can produce a magnetic field up to 1,000 times as strong

as what is produced naturally. Medical devices such as MRIs can produce magnetic fields up to 100,000 times stronger than the naturally occurring magnetic field. The estimated magnetic field strength directly beneath a 600-kV DC transmission line when at full capacity is expected to be approximately 875 mG and 425 mG when at half capacity, averaging about the same as recorded naturally on the earth's surface. The strength of the field decreases rapidly with distance. The average magnetic field drops to 150 mG when 200 feet from the centerline and 100 mG when 300 feet from the centerline (Exponent 2011).

The recommended maximum static magnetic field exposure value from the WHO is 200,000 mG during the working day for occupational exposure. Exposure from the proposed Project would be considerably less than the WHO recommendation, equaling the same exposure level as what occurs naturally. It also is much less than the recommended exposure level (5,000 mG) for cardiac pacemakers and other implanted electronic devices (WHO 2006). The magnetic field of a DC transmission line, unlike an AC transmission line, does not affect paralleling objects such as pipelines (Bailey et al. 1997). The nominal static electric field produced directly underneath a 600-kV DC line is less than 20-kV/m. This drops to less than 5-kV/m at 100 feet from the centerline and nearly to 1-kV/m at 125 feet (Exponent 2011). The electric-field strength from a computer screen at 12 inches is typically 10- to 20-kV/m. Additionally, any activity taking place underneath the centerline, such as recreational activities or travel, would be short-term and transitory. The results of the few electric static studies that have been conducted indicate that the only effects are associated with body hair movement and discomfort from spark discharges (WHO 2006).

Transmission lines would be designed to minimize EMFs. The practice of prudent avoidance is based on limiting exposure to EMFs to the extent practical. Using this approach, transmission lines would not be routed in proximity to residential structures, schools, or other sensitive facilities to the extent practical. Impacts from corona are expected to be minimal due to the rural nature of the project area. Although current research studies do not provide consistent or conclusive evidence linking exposure to EMF from electrical transmission lines to human disease TWE will continue to monitor research on audible noise and EMF to ascertain whether these effects are significant (TWE-54). As a result of the low level of static EMFs that would be produced under and near the proposed transmission line and the applicant's commitment to route away from sensitive land uses when practical, impacts from EMFs would be reduced or non-existent.

Stray voltage and induced current are not produced by the type of EMF from DC transmission lines. Design feature TWE-52 would be applied where project AC lines would be constructed, and would eliminate effects related to induced currents and voltages on conductive objects sharing the transmission line ROW.

Corona on the surface of high voltage conductors can create signals that may interfere with radio and television reception. Modern transmission line design has reduced corona to a minimum and such design is proposed for the proposed Project. Occasionally, more sensitive radio and television sets pick up on "corona noise." Problems would be addressed on a case-by-case basis. Although corona effects can cause television and radio reception interference, they do not represent a threat to human health or safety. TWE-49 and TWE-50 would be implemented to reduce the effects of corona and noise. These design features include the use of materials designed to minimize audible noise and radio and TV interference due to corona, as well as the use of regular patrols so that damaged insulators, which may cause corona, would be quickly repaired. It is anticipated that the implementation of these design features would prevent disruption of emergency communications.

Under Design Option 2, a 500-kV AC transmission line would be constructed approximately 350 miles in length between the new AC/DC converter station in Utah and one of the existing substations in Eldorado Valley, south of Boulder City, Nevada (Marketplace Hub). The 350 miles of AC transmission line would replace DC transmission line for the same segment. The 500-kV AC portion of this design option would transect Regions III and IV. Design Option 3 also would utilize AC transmission. Under Design Option 3,

Phase I, AC transmission lines would be constructed instead of DC transmission lines. The Phase 1 AC portion of this design option would transect Regions I and II. Under Phase 2, AC transmission lines would be converted to DC.

As discussed in Section 3.18.4, Electromagnetic Fields, Corona, and Stray Voltage, EMFs from an AC line differ from a DC line in that EMFs are oscillating and not static. The electric field measurements at 300 and 125 feet from the centerline of a 500-kV AC power line during peak usage would both be less than 1.0-kV/M (SES Two 2008). This is well below the voluntary threshold of 4.2-kV/m established by the ICNIRP. The anticipated magnetic field measurements at 300 and 135 feet from the centerline during peak usage would equal approximately 10 mG and 70 mG, respectively, slightly more than a can opener at 2 feet or a vacuum cleaner at 1 foot (EM Watch 2012). Both electric and magnetic fields drop considerably as distance increases from the centerline. Based on predicted estimates, magnetic and electric fields are expected to diminish rapidly between 50 to 100 feet from the centerline and are insignificant more than 100 feet from the edge of the 250-foot-wide transmission line ROW (Exponent 2011).

Unlike DC transmission lines, AC transmission lines can cause induced current in nearby objects. Induced current occurs along linear features, such as fences that parallel conductors, and typically can be minimized with adequate grounding. To minimize the potential for electric shock, buildings, fences, and other structures with metal surfaces located within 300 feet of the centerline would be grounded. All metal irrigation systems and fences that parallel the AC transmission line for distances of 500 feet or more and are within 300 feet of the centerline would be grounded. Additionally, all fences that cross under the AC transmission line would be grounded (POD, **Appendix D**). Per TWE-52, the Applicant will apply necessary mitigation to eliminate problems of induced currents and voltages onto conductive objects sharing the 250-foot-wide transmission line ROW to the mutual satisfaction of the parties involved.

Under Design Option 2, approximately 55 percent of the mileage from IPP to Marketplace Hub (Regions III and IV) that would be constructed using AC power lines would be co-located with existing utility corridors that may contain pipelines. Under Design Option 3, approximately 40 percent of AC portion of the design option (Regions I and II) would be co-located within existing utility corridors that may contain pipelines. When a high voltage AC transmission line is located adjacent to a pipeline ROW, the pipeline may be subject to electrical interference from electric and magnetic induction. This form of interference is due to the magnetic field produced by the AC current flowing in the conductors of the transmission line coupling with the metallic pipeline, inducing voltage and associated current on the pipeline. To minimize the potential for this interference, measures include reducing the impedance of the transmission structure grounds, grounding the pipeline in conjunction with de-couplers, burying gradient control wires along the pipeline, and using dead fronts at test stations. In locations where the final alignment of an AC section of transmission is in close proximity to a pipeline, computer modeling of AC interference effects would be completed and any required mitigation would be designed and installed prior to energizing the transmission line. Similarly, when a high voltage AC transmission line is located adjacent to a railroad, electric and magnetic induction results from the magnetic field and may result in personal safety hazards, damage to signal and communication equipment, and false signaling of equipment. Specifications from the American Railway Engineering and Maintenance-of-Way Association would be followed to ensure safety of railway operating personnel and the public. In addition, railroad signal and equipment manufacturers provide AC interference voltage tolerances for proper signal operation so that nearby transmission facilities can be designed to ensure AC interference levels do not exceed the acceptable safety criteria (POD, **Appendix D**).

Under Design Option 2, impacts to public health and safety from construction, operation, and decommissioning would be the same as discussed in Section 3.18.7.1, Impacts from Terminal Construction, Operation, and Decommissioning, and earlier in Section 3.18.7.2, Impacts Common to All Alternative Routes and Associated Components. Impacts related to DC effects also would be the same as discussed earlier in Section 3.18.7.2. Impacts would differ from previous analysis at the ground

electrode bed system in Region III. The siting of the proposed ground electrode bed system for Design Option 2, Region III is located within an area that has not previously been analyzed in this section. The proposed ground electrode bed system overlaps the Sheeprock/Tintic OHV SRMA, and there is a wildlife study area (Fish Springs) within 1 mile of the proposed ground electrode bed system. There would be no communities or communication sites within 1 mile of the proposed location. There are no structures within 500 feet of the system. The terminal location for Design Option 2 would be sited near IPP and would require an initial disturbance of 181 acres for construction and a permanent disturbance of 118 acres for operation. There are no residences, communities, parks, developed RAs, or other sensitive receptors within 1 mile of the proposed terminal site; however, there are 6 communication sites within 1 mile of the proposed terminal site and electrode site, as well as 5 communication sites for the transmission line associated with the ground electrode site. The lack of sensitive receptors near the terminal site would result in no impacts from noise and EMF. Impacts from construction would be similar to those detailed for the Southern and Northern Terminals.

Under Design Option 3, impacts to public health and safety would be the same as discussed in Section 3.18.7.1, Impacts from Terminal Construction, Operation, and Decommissioning, and earlier in Section 3.18.7.2, Impacts Common to All Alternative Routes and Associated Components.

Through the implementation of TWE-49, TWE-50, TWE-52, and TWE-54, as well as the mostly remote location of the proposed Project and the limited number of sensitive receptors adjacent to the alignment, minimal to no impacts to public health are anticipated from EMFs, corona, stray voltage, or induced current.

Occupational Safety

During operations, there would be a slight risk for injuries to maintenance workers who travel in the 250-foot-wide transmission line ROW to perform maintenance on the transmission line. To minimize risk, safety measures would be taken that include enforcing red flag warnings, providing appropriate training to all pertinent personnel, keeping vehicles on or within designated roads or work areas, and adhering to NESC, U.S. Department of Labor requirements, and OSHA/State safety standards. Additionally, to reduce the risk to maintenance workers and the public from herbicide application, herbicides would be applied according to label instructions and within recommended rates. As noted, in Section 3.5, Vegetation, mitigation measure **NX-3** would be implemented to ensure herbicide application would follow all applicable state and federal laws.

Through the implementation of proposed safety measures, such as enforcing red flag warnings, providing appropriate training to personnel, and adhering to national/state safety standards, negligible to no impacts from routine maintenance activities are anticipated.

Fire

Impacts to ignition points from operation or maintenance activities such as welding, vehicle ignition, blasting, blading, and overland travel would be similar to those described under Section 3.21.5.1, Impacts from Terminal Construction and Operation. If a wildland fire occurs near the Project, wildland firefighters and fire suppression efforts could be negatively and positively and negatively impacted. The ROW and structures could be an obstacle and another feature requiring fire suppression efforts. The energized line during fires could be a risk to fire fighters on the ground, and limit the area in which airplanes could assist in fire suppression activities. Positive impacts from the Project on wildland fire suppression would include the development of a 250-foot-wide transmission line ROW and additional access roads acting as fire breaks, and providing access to fire personnel. Further discussion of fire hazards is located in Section 3.21.

To minimize the occurrence of fire from the power line, safety measures would be taken that include brush-clearing within the corridor prior to work, enforcing red flag warnings, providing appropriate training to all pertinent personnel, and keeping vehicles on or within designated roads or work areas. To

minimize the impacts of fire during operations, a Fire Protection Plan would be implemented (TWE-64). Additionally, in the event the lines were cut or otherwise downed, the lines are designed to trip out of service (turn off), reducing the chances of fire. Lightning protection would be provided by overhead shield wires on the top of the line.

As discussed further in Section 3.21, Wildland Fire, additional mitigation is proposed to further reduce risk of fire from the transmission line, including consulting with *land management agencies to ensure ROW vegetation management activities align with agencies' fire management objectives. (FR-5) and where appropriate and feasible, micro-siting the alignment through recently burned areas (FR-6).*

Through the implementation of TWE-64 and these additional mitigations, impacts to public health and safety as a result of fire are not expected.

Hazardous Materials

Table 3.18-3 lists the various hazardous materials that potentially would be used in the operation of the transmission line and associated facilities. The procedures for safe handling of these materials would be covered in the Spill Prevention, Notification, and Cleanup Plan (TWE-57) and are covered by a number of regulatory programs as described in Section 3.18.1, Regulatory Background.

Impacts associated with the release or spill of hazardous materials to the environment or people during operations are expected to be minimal with the implementation of TWE-57.

Intentional Destructive Acts

The proposed transmission lines, terminals and other associated facilities could be targets of intentional destructive acts, including sabotage or terrorism. More commonly, intentional acts of destruction would include vandalism or theft. Acts of vandalism and theft are more likely to occur than acts of sabotage and terrorism and are most likely to occur at remote areas and substations. Theft frequently involves equipment and salvageable metal at substations and switchyards. Vandalism often includes shooting out insulators. Sabotage and terrorism would most likely include destruction of key transmission line components with the intent of interrupting the electrical grid. Impacts from intentional destructive acts could range from no noticeable effect on electrical service to a disruption of service. Cameras, signs, and regular inspections of the 250-foot-wide transmission line ROW and facilities by operations personnel would be used as needed to prevent theft, vandalism, and unauthorized access. Additionally, safety and security lighting, as well as security fencing, would be installed at each terminal, substation, and series compensation station. Security staff would consist of support operations and maintenance workers. Reponses to intentional destructive acts would be implemented in accordance with the Applicant's emergency response plan.

Impacts associated with intentional destructive acts are expected to be minimal with the implementation of regular ROW monitoring, cameras, signage, and fencing, as well as the Applicant's emergency response plan.

Decommissioning Impacts

Health and safety impacts for this phase of the Project would be reduced in frequency compared to the construction phase, due to the shorter time period. The same BMPs and design features used in construction would be applied to reduce impacts during decommissioning activities.

3.18.7.3 Region I

Table 3.18-6 provides a tabulation of impacts associated with the alternative routes in Region I.

Table 3.18-6 Summary of Region I Alternative Route Impacts for Public Health and Safety, Hazardous Materials

Parameter		Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Communities		2	2	4	2
Parks or Developed/Dispersed RAs (campgrounds, etc.)		2	2	1	2
Other Sensitive Receptors (schools and daycare centers; health care facilities such as hospitals or retirement and nursing homes; cemeteries; churches)		0	0	1	0
Communication Sites		10	10	23	10
Structures Within 500 feet of the Alignment	Residential	0	0	5	0
	Commercial/Industrial	10	10	16	3
	Agricultural	0	0	0	0
	Outbuildings	0	0	0	0
Structures Within 200 feet of the Alignment	Residential	0	0	0	0
	Commercial/Industrial	1	1	1	2
	Agricultural	0	0	0	0
	Outbuildings	0	0	0	0

Alternative I-A (Applicant Proposed)

Alternative I-A would cross 10 communication sites, 2 RAs, and 2 communities within the analysis area in Region I. The communities within the analysis area are Rawlins, Wyoming, and Elk Springs, Colorado. The 2010 census population for Rawlins was 9,259. There is no census data for Elk Springs. There are 10 commercial/industrial structures within 500 feet of the proposed alignment. The number of structures decreases to 1 commercial/industrial structure within 200 feet of the proposed alignment. There would be two campgrounds, but no other sensitive receptors within the analysis area. The Tuttle Ranch Micro-siting Options 3 and 4 would not substantially affect the impact analysis for public health and safety. Under Design Option 3, Phase 1, AC transmission lines instead of DC transmission lines would be constructed. Under Phase 2, AC transmission lines would be converted to DC. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measure **PH-1**, Project construction and operation would not be expected to substantially affect public health and safety.

Alternative I-B (Agency Preferred)

Alternative I-B would cross 10 communication sites, 2 RAs, and 2 communities within the analysis area in Region I. The communities within the analysis area are Rawlins, Wyoming, and Elk Springs, Colorado. The 2010 census population for Rawlins was 9,259. No census data exist for Elk Springs. There are 10 commercial/industrial structures within 500 feet of the proposed alignment. The number of structures decreases to 1 commercial/industrial structure within 200 feet of the proposed alignment. The majority of the commercial/industrial structures are oil and gas pads. There would be two campgrounds, but no other sensitive receptors within the analysis area. The Tuttle Ranch Micro-siting Options 3 and 4 would not substantially affect the impact analysis for public health and safety. Under Design Option 3, Phase 1, AC transmission lines instead of DC transmission lines would be constructed. Under Phase 2, AC transmission lines would be converted to DC. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measure **PH-1**, Project construction and operation would not be expected to substantially affect public health and safety.

Alternative I-C

Alternative I-C would cross 23 communication sites, 1 cemetery, 1 RA, and 4 communities within the analysis area in Region I. The communities within the analysis area are Elk Springs and Craig, Colorado, and Rawlins and Dixon Town, Wyoming. Craig is located 0.3 mile from the alignment. The portion of Craig located near the alignment is the Craig South Highlands subdivision. Rawlins and Dixon recorded 2010 census populations of 9,259 and 97, respectively. Juniper Hot Springs in Colorado, is located 1 mile from the alignment, but is a resort, not a community. The 2010 census population for Craig was 9,964. No census data exist for Elk Springs. There are 5 residential structures and 16 commercial/ industrial structures within 500 feet of the proposed alignment. The number of structures decreases to 1 commercial/industrial structure within 200 feet of the proposed alignment. The majority of the commercial/industrial structures are oil and gas pads. There is 1 RA (South Beach Trail) within the analysis area. Alternative I-C contains the most communication sites and communities within the analysis area, and also the most structures within 500 feet of the proposed alignment. After considering design features, BMPs and mitigation measure **PH-1**, Project construction and operation would not be expected to substantially affect public health and safety.

Alternative I-D

Alternative I-D would cross 10 communication sites, 2 RAs, and 2 communities within the analysis area in Region I. The communities within the analysis area are Rawlins, Wyoming, and Elk Springs, Colorado. The 2010 census population for Rawlins was 9,259. No census data exists for Elk Springs. There are 3 commercial/industrial structures within 500 feet of the proposed alignment. The number of structures decreases to 2 commercial/industrial structures within 200 feet of the proposed alignment. The majority of the commercial/industrial structures are oil and gas pads. There would be two campgrounds, but no other sensitive receptors within the analysis area. The Tuttle Ranch Micro-siting Options 3 and 4 would not substantially affect the impact analysis for public health and safety. Alternative I-D contains the most structures within 200 feet of the proposed alignment. Under Design Option 3, Phase 1, AC transmission lines would be constructed. Under Phase 2, AC transmission lines would be converted to DC. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measure **PH-1**, Project construction and operation would not be expected to substantially affect public health and safety.

Alternative Ground Electrode Systems in Region I

Table 3.18-7 provides a comparison of alternative electrode facility locations proposed within 10 to 100 miles of the Northern Terminal. Some locations might serve multiple alternative routes, while others could only be associated with a specific alternative route.

Table 3.18-7 Summary of Region I Alternative Ground Electrode System Location Impacts for Public Health and Safety, Hazardous Materials

Alternative Ground Electrode System Locations	Analysis
Bolton Ranch (All Alternatives)	There are no communities, sensitive receptors, recreation sites, or communication sites within 1 mile of the proposed ground electrode system location or its associated transmission line. There are no structures within 500 feet of the alignment.
Separation Flat (All Alternatives)	There are no communities, sensitive receptors, recreation sites, or communication sites within 1 mile of the proposed ground electrode system location or its associated transmission line. There are no structures within 500 feet of the alignment.
Separation Creek (All Alternatives)	There are no communities, sensitive receptors, recreation sites, or communication sites within 1 mile of the proposed ground electrode system location or its associated transmission line. There are no structures within 500 feet of the alignment.
Eight Mile Basin (All Alternatives)	There are no communities, sensitive receptors, recreation sites, or communication sites located within 1 mile of the proposed ground electrode system location; however, there are 2 outbuildings located within 1 mile of the proposed ground electrode system location. There are 3 communication sites, 4 outbuildings, one city (Rawlins, Wyoming), and 10 residences within 1 mile of the alignment.

Region I Conclusion

Alternative I-A, Alternative I-B, Alternative I-C, and Alternative I-D would have similar impacts on public health and safety, with the exception that, as detailed in **Table 3.18-6**, Alternative I-C potentially would affect a greater number of communities and residential structures than the remaining alternatives. This would increase the potential project construction and operation health and safety risk to residential occupants. However, the successful implementation of design features, BMPs, and mitigation **PH-1**, would result in all of the alternatives having a relatively low impact on public health and safety.

3.18.7.4 Region II

Table 3.18-8 provides a tabulation of impacts associated with the alternative routes in Region II.

Table 3.18-8 Summary of Region II Alternative Route Impacts for Public Health and Safety, Hazardous Materials

Parameter		Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F	Alternative II-G
Communities		7	8	11	4	5	2	5
Parks or Developed and Dispersed RAs (campgrounds, etc.)		11	139	4	37	11	16	19
Other Sensitive Receptors (schools and daycare centers; health care facilities such as hospitals or retirement and nursing homes; cemeteries; churches)		3	3	3	5	4	3	3
Communication Sites		47	122	151	75	73	65	55
Structures Within 500 feet of the Alignment	Residential	16	5	2	3	27	4	22
	Commercial/ Industrial	4	12	11	0	4	0	4
	Agricultural	0	0	2	0	0	0	0
	Outbuildings	6	2	3	0	5	0	8
Structures Within 200 feet of the Alignment	Residential	1	2	0	0	2	0	2
	Commercial/ Industrial	0	4	4	0	1	0	0
	Agricultural	0	0	0	0	0	0	0
	Outbuildings	1	0	1	0	1	0	1

Alternative II-A (Applicant Proposed)

Alternative II-A would cross 47 communication sites, 9 parks and RAs (including 4 WMAs), 7 communities, 2 cemeteries and 1 church within the analysis area in Region II. The communities within the analysis area with 2010 census data are Dinosaur, Nephi, Roosevelt City, Ballard, and Fort Duchesne. The 2010 census populations were: Dinosaur – 339; Nephi – 5,389; Roosevelt City – 6,046; Ballard – 801; and Fort Duchesne – 714. Dinosaur is in Colorado and the remainder of the affected communities are in Utah. A full list of communities, parks and developed RAs, and other sensitive receptors can be found in **Table 3.18-9**. There are 16 residential structures, 4 commercial/industrial structures, and 6 outbuildings within 500 feet of the proposed alignment. The number of structures decreases to 1 residential structure and 1 outbuilding within 200 feet of the proposed alignment. The majority of the commercial/industrial structures are oil and gas pads. There are 2 dispersed RAs, 2 SRMAs, 2 developed campgrounds, and 1 day-use area within the analysis area, in addition to the 4 WMAs. The Strawberry IRA and Fruitland Micro siting Options would not substantially affect the impact analysis for public health and safety. Sand dunes within Alternative II-A also may affect the safety of workers and the public during construction and operation. Specialized foundations potentially required in this area may include micro-pile, helical pile, grouted, epoxy grouted, grillage, driven pile, vibratory pile

and/or steel caisson type designs. All specialized foundations will be determined during final design (see Sections 3.3 and 4.1 for further details).

The proposed Project traverses large expanses of western Utah known for Open OHV opportunities, specifically the BLM Fillmore and Salt Lake FOs. Area managers have expressed concerns over public safety risks from potential collisions with guyed structures, due to their low-visibility to users traveling at higher speeds as well as the spread between the guy and the more visible transmission structure. The 2013 Report on ATV-Related and Death and Injuries Compiled by the U. S. Consumer Product Safety Commission (February 2015) reports 13,043 reported ATV-related fatalities in the U S, between 1982 and 2011, 218 of which were in Utah. Causes of injury or death were not identified, but the report indicated the majority of the 2011 emergency-department treated injuries were contusions/abrasions or fractures and most commonly of the arm, or head/neck. A survey of available state incident reports (which did not include Utah) between 2008 and 2014 period indicated that rollovers, machine-machine collisions, and fixed object collisions (trees) were the major causes of death; no transmission tower or guy wire collisions were noted in any annual report (WDNR 2015, MDNR 2015). However, guy wires are typically identified as a potential work hazard at sites where ATV/OHVs are used, and it is a recommended practice to eliminate or identify and mark such hazards (NIOSH 2012). To further address this concern, the following mitigation is proposed to reduce the potential public safety risk concerning OHV users:

***REC-9**: The applicant shall use self-supporting structures in place of guyed-lattice structures in the Salt Lake and Fillmore FOs. The applicant shall use orange, visibility-enhancing guy-wire sleeves in areas where guy-wire visibility is a safety concern. These measures would be implemented on a site-specific basis and in coordination with the BLM and Western.*

Application of this mitigation would reduce would reduce potential public safety risks for OHV users.

Under Design Option 3, Phase 1, AC transmission lines instead of DC transmission lines would be constructed. Under Phase 2 AC transmission lines would be converted to DC. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measures **PH-1** and **REC-9**, Project construction and operation would not be expected to substantially affect public health and safety.

Alternative II-B

Alternative II-B would cross 122 communication sites, 8 communities, 138 parks and RAs (including 1 WMA and a state park), 2 cemeteries, and 1 school within the analysis area in Region II. The nearest community within the analysis area to the alignment is Nephi, Utah, which is transected by the alignment. Rangely, Colorado recorded a 2010 population of 2,365. Thompson Springs, Green River, Lynndyl, Mount Pleasant, and Nephi, all in Utah, are within the analysis area and have 2010 census population dataas follows: Thompson Springs – 39; Green River – 952; Lynndyl - 952; Mount Pleasant – 3,260; and Nephi – 5,389. A full list of communities, parks and developed RAs, and other sensitive receptors can be found in **Table 3.18-9**. There are 5 residential structures, 12 commercial/industrial, and 2 outbuildings within 500 feet of the proposed alignment. The number of structures decreases to 2 residential structures and 4 commercial/industrial structures within 200 feet of the proposed alignment. The majority of the commercial/industrial structures are oil and gas pads. There are 132 dispersed campgrounds, 3 developed campgrounds, 2 SRMAs, and 1 RA in addition to the WMAs and state park within the analysis area. Alternative II-B contains the most RAs among the Project alternatives, as well as the most structures within 200 feet of the proposed alignment. To limit safety hazards to OHV and other recreational users, mitigation measure **REC-9** would be used (see discussion under Alternative II-A). Under Design Option 3, Phase 1, AC transmission lines instead of DC transmission lines would be constructed. Under Phase 2, AC transmission lines would be converted to DC. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measures **PH-1** and **REC-9**, Project construction and operation would not be expected to substantially affect public health and safety.

Table 3.18-9 Human Resources by Alternative within Region II

	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F	Alternative II-G
Communities[1]	(Colorado) Dinosaur (Utah) Upalco, Fruitland, Nephi, Roosevelt City, Ballard, Fort Duchesne	(Colorado) Carbonera, Rangely (Utah) Thompson Springs, Crescent Junction, Nephi, Mount Pleasant, Green River, Lynndyl	(Colorado) Carbonera, Rangely (Utah) Thompson Springs, Crescent Junction, Moore, Harding, McCornick, Emery, Aurora, Green River, Salina	(Colorado) Dinosaur (Utah) Nephi, Helper, Clear Creek	(Colorado) Dinosaur (Utah) Nephi, Roosevelt City, Fort Duchesne, Ballard	(Colorado) Dinosaur (Utah) Nephi	(Colorado) Dinosaur (Utah) Nephi, Roosevelt City, Fort Duchesne, Ballard
(WMAs, Parks, or Developed RAs[2]	(Utah) Rabbit Gulch WMA, Wildcat WMA, Jackson WMA, Spencer Fork WMA, Strawberry River Day Use Area, Little Sahara SRMA, Sheeprock/Tintic OHV SRMA	(Utah) Triangle Ranch WMA, Green River State Park, Iron Wash Kiosk Site, Sheeprock/Tintic OHV SRMA	(Utah) Green River State Park, Iron Wash Kiosk Site, Sheeprock/Tintic OHV SRMA	(Utah) Triangle Ranch WMA, Hilltop WMA, Castle Gate Park, Electric Reservoir, Little Sahara SRMA, Sheeprock/Tintic OHV SRMA	(Utah) Dairy Fork WMA, Jackson WMA, Spencer Fork WMA, Triangle Ranch WMA, Bamberger Monument, Little Sahara SRMA, Sheeprock/Tintic OHV SRMA	(Utah) Dairy Fork WMA, Jackson WMA, Spencer Fork WMA, Little Sahara SRMA, Sheeprock/Tintic OHV SRMA	(Utah) Rabbit Gulch WMA, Wildcat WMA, Jackson WMA, Triangle Ranch WMA, Spencer Fork WMA, Strawberry River Day Use Area
Other Sensitive Receptors	(Utah) Fruitland Cemetery, Utahn Cemetery, Church of Jesus Christ of Latter Day Saints	(Utah) Thompson Cemetery, Woodside Cemetery, Newton School	(Utah) Thompson Cemetery, Church of Jesus Christ of Latter Day Saints, and Newton School	(Utah) Deadmans Grave Cemetery, Castle Gate Cemetery, Saint Anthony School, Sally Mauro School, Saint Anthony Catholic Church	(Utah) Deadmans Grave, Mill Fork Cemetery, Old Lake Cemetery, Church of Jesus Christ of Latter Day Saints	(Utah) Deadmans Grave, Mill Fork Cemetery, Church of Jesus Christ Latter Day Saints	(Utah) Fruitland Cemetery, Utahn Cemetery, Church of Jesus Christ of Latter Day Saints

[1] Some communities do not have census population data, are rural in nature, and may no longer be inhabited.

[2] Does not include names of developed campgrounds. Developed campgrounds are accounted for in **Table 3.18-8**.

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Alternative II-C

Alternative II-C would cross 151 communication sites, 11 communities, 3 parks and RAs (including 1 state park), 1 church, 1 cemetery, and 1 school that are within the analysis area in Region II. There is no census population data for the community of Carbonera, Colorado. Rangely, Colorado, recorded a 2010 population of 2,365. Thompson Springs, Aurora, Emery, Green River, and Salina, all in Utah, are the only communities within the analysis area corridor that have census population data. The 2010 populations were: Thompson Springs – 39; Aurora - 1,016; Emery – 288; Green River – 952; and Salina 2,489. A full list of communities, parks and developed RAs, and other sensitive receptors can be found in **Table 3.18-9**. There are 2 residential structures, 11 commercial/industrial structures, 2 agricultural structures, and 3 outbuildings within 500 feet of the proposed alignment. The number of structures decreases to 4 commercial/industrial structures and 1 outbuilding within 200 feet of the proposed alignment. The majority of the commercial/industrial structures are oil and gas pads. There is 1 SRMA, 1 RA, and 1 developed campground within the analysis area, in addition to the state park. Alternative II-C contains the most communication sites and communities among the Project alternatives. To limit safety hazards to OHV and other recreational users, mitigation measure **REC-9** would be used (see discussion under Alternative II-A). Under Design Option 3, Phase 1, AC transmission lines instead of DC transmission lines would be constructed. Under Phase 2, AC transmission lines would be converted to DC. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measures **PH-1** and **REC-9**, Project construction and operation would not be expected to substantially affect public health and safety.

Alternative II-D

Alternative II-D would cross 75 communication sites, 4 communities, 35 parks and RAs (including 2 WMAs), 2 cemeteries, 1 church, and 2 schools that are within the analysis area in Region II. The nearest community within the corridor to the alignment is Nephi, Utah, which is transected by the alignment. Dinosaur in Colorado and Clear Creek, Nephi, and Helper in Utah are within the analysis area and all have census population data. The 2010 populations were: Dinosaur – 339; Clear Creek – 4; Nephi – 5,389; and Helper – 2,201. A full list of communities, parks and developed RAs and other sensitive receptors can be found in **Table 3.18-9**. There are 3 residential structures within 500 feet of the proposed alignment. There are no structures within 200 feet of the proposed alignment. There are 10 developed campgrounds, 22 dispersed campgrounds, 2 SRMAs, and 1 RA (Electric Reservoir) within the analysis area, in addition to the 2 WMAs. This alternative as well as Alternative II-F, has the least amount of structures within 200 feet of the alignment. Sand dunes within Alternative II-D also may affect the safety of workers and the public during construction and operation. Specialized foundations may be required in this area and may include micro-pile, helical pile, grouted, epoxy grouted, grillage, driven pile, vibratory pile and/or steel caisson type designs. The need for and design of specialized foundations will be determined during final design (see Sections 3.3 and 4.1 for further details). Additionally, mitigation measure **REC-9** would reduce the risk, specifically to recreational users of the area (see discussion under Alternative II-A). Under Design Option 3, Phase 1, AC transmission lines instead of DC transmission lines would be constructed. Under Phase 2, AC transmission lines would be converted to DC. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measures **PH-1** and **REC-9**, Project construction and operation would not be expected to substantially affect public health and safety.

Alternative II-E

Alternative II-E would cross 73 communication sites, 5 communities, 9 parks and RAs (including 4 WMAs and 1 monument), 3 cemeteries, and 1 church that are within the analysis area in Region II. The nearest community within the corridor to the alignment is Nephi, Utah which is transected by the alignment. The 2010 populations were: Dinosaur – 339; Ballard – 801; Nephi – 5,389; Roosevelt – 6,046; and Fort Duchesne – 714. Dinosaur is in Colorado and the remaining communities are in Utah. A full list of communities, parks and developed RAs and other sensitive receptors can be found in

Table 3.18-9. There are 27 residential structures, 4 commercial/ industrial structures, and 5 outbuildings within 500 feet of the proposed alignment. The number of structures decreases to 2 residential structures, 1 commercial/industrial structure, and 1 outbuilding within 200 feet of the proposed alignment. The commercial/industrial structure is an oil and gas pad. There are two developed campgrounds, two dispersed campgrounds, and two SRMAs within the analysis area, in addition to the four WMAs and one monument. Alternative II-E contains the most structures within 500 feet of the proposed alignment. Sand dunes within Alternative II-E also may affect the safety of workers and the public during construction and operation. Specialized foundations may be required in this area and may include micro-pile, helical pile, grouted, epoxy grouted, grillage, driven pile, vibratory pile and/or steel caisson type designs. The need for and design of specialized foundations will be determined during final design (see Sections 3.3 and 4.1 for further details). Additionally, mitigation measure **REC-9** would reduce the risk, specifically to recreational users of the area (see discussion under Alternative II-A). Under Design Option 3, Phase 1, AC transmission lines instead of DC transmission lines would be constructed. Under Phase 2, AC transmission lines would be converted to DC. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measures **PH-1** and **REC-9**, Project construction and operation would not be expected to substantially affect public health and safety.

Alternative II-F

Alternative II-F would cross 65 communication sites, 2 communities, 14 parks (includes 3 WMAs), 2 cemeteries, and 1 church that are within the analysis area in Region II. The communities of Dinosaur, Colorado, and Nephi, Utah, are within the analysis area and have census population data. The nearest community within the corridor to the alignment is Nephi, Utah, which is transected by the alignment. The 2010 population of Dinosaur and Nephi were 339 and 5,389, respectively. A full list of communities, parks and developed RAs and other sensitive receptors can be found in **Table 3.18-9**. There are 4 residential structures within 500 feet of the proposed centerline. There are no structures within 200 feet of the proposed alignment. There are nine developed campgrounds, two dispersed campgrounds, two SRMAs, and three WMAs within the analysis area. This alternative as well as Alternative II-D have the least amount of structures within 200 feet of the alignment. This alternative also contains the least amount of communities. Sand dunes within Alternative II-F also may affect the safety of workers and the public during construction and operation. Specialized foundations may be required in this area and may include micro-pile, helical pile, grouted, epoxy grouted, grillage, driven pile, vibratory pile and/or steel caisson type designs. The need for and design of specialized foundations will be determined during final design (see Sections 3.3 and 4.1 for further details). To limit safety hazards to OHV and other recreational users, mitigation measure **REC-9** would be used (see discussion under Alternative II-A). Under Design Option 3, Phase 1, AC transmission lines instead of DC transmission lines would be constructed. Under Phase 2, AC transmission lines would be converted to DC transmission lines. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measures **PH-1** and **REC-9**, Project construction and operation would not be expected to substantially affect public health and safety.

Alternative II-G (Agency Preferred)

Alternative II-G would cross 55 communication sites, 5 communities, 17 parks and RAs (including 5 WMAs and multiple day use areas), 2 cemeteries, and 1 church within the analysis area in Region II. The nearest community within the corridor to the alignment is Nephi, Utah, which is transected by the alignment. The 2010 populations were: Dinosaur – 339; Ballard – 801; Nephi – 5,389; Roosevelt – 6,046; and Fort Duchesne – 714. Dinosaur is in Colorado and the remainder of the communities are in Utah. A full list of communities, parks and developed RAs and other sensitive receptors can be found in **Table 3.18-9**. There are 22 residential structures, 4 commercial/industrial structures, and 8 outbuildings within 500 feet of the proposed alignment. The number of structures decreases to 2 residential structures and 1 outbuilding within 200 feet of the proposed alignment. There are 2 developed campgrounds, 2 dispersed campgrounds, 2 SRMAs, and 8-day use areas within the

analysis area, in addition to the 5 WMAs. The Strawberry IRA Micro Siting Option would not substantially affect the impact analysis for public health and safety. The Fruitland Micro Siting Option would contain 7 residential structures and 1 church within 500 feet of the proposed alignment. The number of residential structures decreases to 2 within 200 feet of the proposed alignment. The Fruitland Micro Siting Option within Alternative II-G affects 6 more residential buildings within 500 feet than the Fruitland Micro Siting Option for Alternative II-A. Of the three additional Fruitland Micro Siting Options, Option 3 affects the most residences within 500 feet of the proposed alignment with 12 residences. Option 2 affects 5, while Option 1 affects 3. All of the Fruitland Micro Siting Options for Alternative II-G affect one residential building within 200 feet. The Sand Dunes within Alternative II-G also may affect the safety of workers and the public during construction and operation. Specialized foundations may be required in this area and may include micro-pile, helical pile, grouted, epoxy grouted, grillage, driven pile, vibratory pile and/or steel caisson type designs. The need for and design of specialized foundations will be determined during final design (see Sections 3.3 and 4.1 for further details). Additionally, mitigation measure **REC-9** would reduce the risk, specifically to recreational users of the area (see discussion under Alternative II-A). Under Design Option 3, Phase 1, AC transmission lines instead of DC transmission lines would be constructed. Under Phase 2, AC transmission lines would be converted to DC. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measures **PH-1** and **REC-9**, Project construction and operation would not be expected to substantially affect public health and safety.

Alternative Variation in Region II

Reservation Ridge Alternative Variation

There are two communication sites and two developed campgrounds within the analysis area. There are no communities or sensitive receptors within the analysis area. There are 12 residences within 500 feet of the alignment, reducing to 2 residences within 200 feet of the alignment. To limit safety hazards to OHV and other recreational users, mitigation measure **REC-9** would be used (see discussion under Alternative II-A).

Alternative Connectors in Region II

Table 3.18-10 summarizes impacts associated with the alternative connectors in Region II.

Table 3.18-10 Summary of Region II Alternative Connector Impacts for Public Health and Safety, Hazardous Materials

Alternative Connector	Analysis
Roan Cliffs Alternative Connector	There are no communities, public gathering areas, RAs, or communication sites within the analysis area. There no structures within 500 feet of the alignment.
Castle Dale Alternative Connector	There are no communities, public gathering areas, RAs, or communication sites within the analysis area. There no structures within 500 feet of the alignment.
Price Alternative Connector	There are two communities (Wattis and Wattis Junction) and one park (Gordon Creek WMA) within the analysis area. There is no census data for either community. There are no public gathering areas, or communication sites within the analysis area. There are no structures within 500 feet of the alignment.
Lynndyl Alternative Connector	There are no communities, public gathering areas, RAs, or communication sites within the analysis area. There is 1 commercial/industrial structure within 500 feet of the alignment.
IPP East Alternative Connector	There are no public gathering areas or RAs within the analysis area; however, the community of Lynndyl (2010 population 106) and 4 communication sites are within the analysis area. There are no structures within 500 feet of the alignment.

Region II Series Compensation Stations (Design Option 3)

If Design Option 3 were implemented, a series compensation station would be necessary along the alternative routes of Region II during the first-phase (AC operation). There are three potential sites, each corresponding to specific alternative routes. Upon completion of Phase 2 of Design Option 2, when there was no utility for the station, it would be deconstructed and reclaimed to the original condition. These series compensation station alternatives are depicted in **Figure 2-3**.

Series Compensation Station 1 – Design Option 3 corresponds to Alternatives II-A, II-E, and II-G. There are no communities or sensitive receptors within 1 mile of the proposed series compensation station; however, there is one RA and 2 communication sites. There also are no structures within 500 feet of the series compensation station.

Series Compensation Station 2 – Design Option 3 corresponds to Alternatives II-B and II-C. There are no communities, sensitive receptors, RAs, or communication sites within 1 mile of the proposed series compensation station. There also are no structures within 500 feet of the series compensation station.

Series Compensation Station 3 – Design Option 3 corresponds to Alternatives II-D and II-F. There are no communities, sensitive receptors, RAs, or communication sites within 1 mile of the proposed series compensation station. There also are no structures within 500 feet of the series compensation station.

Region II Conclusion

Alternative II-A, Alternative II-B, Alternative II-C, Alternative II-D, Alternative II-E, Alternative II-F, and Alternative II-G would have similar impacts on public health and safety, with the exception that, as detailed in **Table 3.18-8**, Alternative II-B would affect more parks, and RAs than the remaining alternatives. This would increase the potential Project construction and operation health and safety risk to residential occupants and visitors to parks and recreational areas. However, the successful implementation of design features, BMPs, and mitigation measures **PH-1** and **REC-9**, would result in all of the alternatives having a relatively low impact on public health and safety.

3.18.7.5 Region III

Table 3.18-11 provides a tabulation of impacts associated with the alternative routes in Region III.

Table 3.18-11 Summary of Region III Alternative Route Impacts for Public Health and Safety, Hazardous Materials

Parameter		Alternative III-A	Alternative III-B	Alternative III-C	Alternative III-D
Communities		4	2	2	2
Parks or developed/dispersed RAs (campgrounds, etc.)		13	1	1	1
Other Sensitive Receptors (schools and daycare centers; health care facilities such as hospitals or retirement and nursing homes; cemeteries; churches)		1	0	0	0
Communication Sites		25	132	124	131
Structures Within 500 feet of the Alignment	Residential	0	0	1	0
	Commercial/Industrial	0	0	1	0
	Agricultural	0	0	0	0
	Outbuilding	0	0	0	0
Structures Within 200 feet of the Alignment	Residential	0	0	0	0
	Commercial/Industrial	0	0	1	0
	Agricultural	0	0	0	0
	Outbuilding	0	0	0	0

Alternative III-A (Applicant Proposed)

Alternative III-A would entail crossing 25 communication sites, 13 parks and RAs (the Jefferson Hunt Monument, Mountain Meadows site, and 11 dispersed campgrounds), 4 communities, and 1 cemetery that are within the analysis area in Region III. The community of Central, Utah, is transected by the alignment. The 2010 population of Central was 613. The community of Jackman, Nevada, is located 420 feet from the alignment. No census population data exist for Jackman. Central, Newcastle, and Moapa Valley are within the analysis area and have census population data. The 2010 populations were: Central – 613; Moapa Valley – 801; and Newcastle – 247. Both Central and Newcastle are in Utah, while Moapa Valley is located in Nevada. A list of communities, parks and developed RAs, and other sensitive receptors can be found in **Table 3.18-12**. There are no structures within 500 feet and 200 feet of the proposed alignment. Alternative III-A contains the least communication sites, but the most sensitive receptors and communities within the analysis area. Alternatives III-A, III-B, and III-D contain the least structures within 500 and 200 feet of the alignments.

Region III includes areas of western Utah known for Open OHV opportunities, specifically in the BLM Fillmore FO. Area managers have expressed concerns over public safety risks from potential collisions with guyed structures, due to their low-visibility to users traveling at higher speeds as well as the spread between the guy and the more visible transmission structure. As discussed in Section 3.18.7.4 (under Alternative II-A), a survey of available state OHV incident reports did not include any incidents involving transmission tower or guy wire collisions (WDNR 2015, MDNR 2015). However, guy wires are typically identified as a potential work hazard at sites where ATV/OHVs are used, and it is a recommended practice to eliminate or identify and mark such hazards (NIOSH 2012). To address this concern, **REC-9** is proposed to reduce the potential public safety risk concerning OHV users.

REC-9: *The applicant shall use self-supporting structures in place of guyed-lattice structures in the Salt Lake and Fillmore FOs. The applicant shall use orange visibility-enhancing guy-wire sleeves in areas where guy-wire visibility is a safety concern. These measures would be implemented on a site-specific basis and in coordination with the BLM and Western.*

Application of this mitigation would reduce would reduce potential public safety risks for OHV users.

Under Design Option 2, AC transmission lines instead of DC lines would be constructed. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measures **PH-1** and **REC-9**, Project construction and operation would not be expected to affect public health and safety significantly.

Table 3.18-12 Human Resources by Alternative within Region III

	Alternative III-A	Alternative III-B	Alternative III-C	Alternative III-D
Communities[1]	(Utah) Central, Newcastle (Nevada) Jackman, Moapa Valley	(Nevada) Moapa, Moapa Valley	(Nevada) Beaverdam, North Las Vegas	(Nevada) Moapa, Moapa Valley
Parks or Developed RAs[2]	(Utah) Jefferson Hunt Monument, Mountain Meadows NHL and Site	Cricket Mountains ATV Area	Old State Boundary Historical Marker	Cricket Mountains ATV Area
Other Sensitive Receptors	Hamblin Cemetery	NA	NA	NA

[1] Some communities do not have census population data, are rural in nature, and may no longer be inhabited.

[2] Does not include names of developed campgrounds. Developed campgrounds are accounted for in **Table 3.18-11**.

Alternative III-B

Alternative III-B would cross 132 communication sites and 2 communities that are within the analysis area in Region III. One RA is within the analysis area. Moapa Valley and Moapa Town, both in Nevada, are within the analysis area and have census population data. The 2010 population counts of Moapa Town and Moapa Valley were 1,025 and 6,924, respectively. A full list of communities, parks, and developed RAs and other sensitive receptors can be found in **Table 3.18-12**. There are no structures within 500 feet and 200 feet of the proposed alignment. Alternatives III-A, III-B, and III-D contain the least structures within 200 feet of the alignment; however, Alternative B contains the most communication sites with the proposed alignment. To limit safety hazards to OHV and other recreational users, mitigation measure **REC-9** would be used (see discussion under Alternative III-A). Under Design Option 2, AC transmission lines instead of DC lines would be constructed. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measures **PH-1** and **REC-9**, Project construction and operation would not be expected to significantly affect public health and safety.

Alternative III-C

Alternative III-C would cross 124 communication sites, 2 communities, and 1 park (state boundary historical marker) within the analysis area in Region III. North Las Vegas, Nevada, intersects the alignment, and the community of Beaverdam, Nevada, is within the analysis area. Both have census population data. The 2010 populations of Beaverdam and North Las Vegas were 44 and 216,961, respectively. A full list of communities, parks and developed RAs, and other sensitive receptors can be found in **Table 3.18-12**. There is 1 residential structure and 1 commercial/industrial structure within 500 feet of the proposed alignment. The number of structures decreases to 1 commercial/ industrial structure within 200 feet of the proposed alignment. To limit safety hazards to OHV and other recreational users, mitigation measure **REC-9** would be used (see discussion under Alternative III-A). Under Design Option 2, AC transmission lines instead of DC lines would be constructed. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measures **PH-1** and **REC-9**, Project construction and operation would not be expected to substantially affect public health and safety.

Alternative III-D (Agency Preferred)

Alternative III-D would cross 131 communication sites and 2 communities within the analysis area in Region III. One RA is within the analysis area. Moapa Valley and Moapa Town, both in Nevada, are within the analysis area and have census population data. The 2010 population of Moapa Town and Moapa Valley were 1,025 and 6,924, respectively. A full list of communities, parks, and developed RAs and other sensitive receptors can be found in **Table 3.18-12**. There are no structures within 500 feet and 200 feet of the proposed alignment. Alternatives III-A, III-B, and III-D contain the least structures within 200 feet of the alignment. To limit safety hazards to OHV and other recreational users, mitigation measure **REC-9** would be used (see discussion under Alternative III-A). Under Design Option 2, AC transmission lines instead of DC lines would be constructed. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measures **PH-1** and **REC-9**, Project construction and operation would not be expected to substantially affect public health and safety.

Alternative Variations in Region III

Table 3.18-13 summarizes potential impacts associated with the alternative variations in Region III.

Table 3.18-13 Summary of Region III Alternative Variation Impacts for Public Health and Safety, Hazardous Materials

Alternative Variation	Analysis
Ox Valley East Alternative Variation (Alternative III-A)	There would be three dispersed camping areas and five communication sites within the analysis area of this alternative variation. There would be no structures within 500 feet of the alignment. This variation would bypass one segment of Alternative III-A. Within this segment is one park (the Mountain Meadows NHL and Site), six dispersed camping sites, and one cemetery. There are no structures within 500 feet of the alignment. This alternative variation would bypass the Mountain Meadows NHL and Site.
Ox Valley West Alternative Variation (Alternative III-A)	There would be four dispersed camping areas, five communication sites within the analysis area of this alternative variation. There would be no structures within 500 feet of the alignment. This variation would bypass one segment of Alternative III-A. Within this segment is one park (the Mountain Meadows NHL and Site), six dispersed camping sites, and one cemetery. There are no structures within 500 feet of the bypassed segment of this alignment This alternative variation would bypass the Mountain Meadows NHL and Site.
Pinto Alternative Variation	There would be 1 community, 1 cemetery, 20 dispersed camping areas, 9 communication sites within the analysis area. The community of Central, Utah is located 1,300 feet from the alignment and had a 2010 population of 613. There are no structures within 500 feet of the alignment. This variation would bypass two segments of Alternative III-A. Within these segments are two parks (including the Mountain Meadows NHL and Site), 6 dispersed camping sites, 7 communication sites, and 1 cemetery. This alternative variation would bypass the Mountain Meadows NHL and Site.

Alternative Connectors in Region III

Table 3.18-14 summarizes potential impacts associated with the alternative connectors in Region III.

Table 3.18-14 Summary of Region III Alternative Connector Impacts for Public Health and Safety, Hazardous Materials

Alternative Connector	Analysis
Avon Alternative Connector	There are no public gathering areas or RAs within the analysis area; however, there is one community – Avon, Utah. There is no census population data for Avon, which is representative of its rural nature. Avon is located approximately 740 feet from the alignment. There are no structures within 500 feet of the alignment. There are five communication sites within the analysis area.
Arrowhead Alternative Connector	There are four communication sites, one community (Moapa, Nevada), one RA, and one school within the analysis area. The Town of Moapa had a 2010 census population of 1,025. There is 1 residence within 500 feet of the alignment.
Moapa Alternative Connector	There are no communities, public gathering areas or RAs within the analysis area. There are no structures within 500 feet of the alignment. There are five communication sites within the analysis area.

Alternative Ground Electrode Systems in Region III

Table 3.18-15 provides a comparison of alternative electrode facility locations proposed near the Southern Terminal. Some locations might serve multiple alternative routes, while others could only be associated with a specific alternative route.

Region III Series Compensation Stations (Design Option 2)

If Design Option 2 were implemented, a series compensation station would be necessary along the AC-configured alternative routes of Region III. There are three potential sites, each corresponding to a specific alternative route. These series compensation station alternatives are depicted in **Figure 2-2**.

Series Compensation Station 1 – Design Option 2 corresponds to Alternative III-A. There are no sensitive receptors, RAs, or communication sites within 1 mile of the proposed series compensation station; however, there is one community, Avon. There is no census population data for Avon. There also are no structures within 500 feet of the series compensation station.

Series Compensation Station 2 – Design Option 2 corresponds to Alternative III-C. There are no communities, sensitive receptors, RAs, or communication sites within 1 mile of the proposed series compensation station. There also are no structures within 500 feet of the series compensation station.

Table 3.18-15 Summary of Region III Alternative Ground Electrode System Location Impacts for Public Health and Safety, and Hazardous Materials

Alternative Ground Electrode System Locations	Analysis
Mormon Mesa- Carp Elgin Rd (Alternatives III-A, III-B, and III-D)	There would be no communities, public gathering areas or recreation sites located within 1 mile of the proposed ground electrode system location; however, there would be 1 communication site. Eighty-nine communication sites are located within 1 mile of the associated overhead electrical line. There are no structures within 500 feet of the proposed ground electrode system location or overhead electrical line.
Halfway Wash- Virgin River (Alternatives III-A, III-B, and III-D)	There would be no communities, public gathering areas or recreation sites located within 1 mile of the proposed ground electrode system location or its associated overhead electrical line; however, there would be 1 communication site located within 1 mile of the associated overhead electrical line. There are no structures within 500 feet of the proposed ground electrode system location or overhead electrical line.
Halfway Wash East (Alternatives III-A, III-B, and III-D)	There would be no communities, public gathering areas or recreation sites located within 1 mile of the proposed ground electrode system location or overhead electrical line. Thirteen communication sites are located within 1 mile of the proposed location and overhead electrical line. There is 1 commercial/industrial structure within 500 feet of the proposed ground electrode system location and overhead electrical line.
Meadow Valley 2 (Alternative III-C)	There would be no communities, public gathering areas or recreation sites located within 1 mile of the proposed ground electrode system location; however, there would be 3 communication sites. Nine communication sites are located with 1 mile of the proposed location and overhead electrical line. There are no structures within 500 feet of the proposed ground electrode system location or its overhead electrical line.
Delta (Design Option 2)	There would be no communities, public gathering areas or recreation sites located within 1 mile of the proposed ground electrode system location; however, there would be 3 communication sites. There are no structures within 500 feet of the proposed ground electrode system location or its associated overhead electrical line.

Series Compensation Station 3 – Design Option 2 corresponds to Alternative III-B and III-D

There are no communities, sensitive receptors, and RAs within 1 mile of the proposed series compensation station; however there are two communication sites. There also are no structures within 500 feet of the series compensation station.

Region III Conclusion

Alternative III-A, Alternative III-B, Alternative III-C, and Alternative III-D would have similar impacts on public health and safety, with the exception that Alternative III-A would affect more communities, parks, and RAs than the remaining alternatives and less communication structures as detailed in **Table 3.18-11**. Ultimately, this would increase the potential Project construction and operation health and safety risk to residential occupants and visitors to parks and recreational areas. However, the successful implementation of design features, BMPs, and mitigation measure **PH-1** would result in all of the alternatives having a relatively low impact on public health and safety.

3.18.7.6 Region IV

Table 3.18-16 provides a tabulation of impacts associated with the alternative routes in Region IV.

Table 3.18-16 Summary of Region IV Alternative Route Impacts for Public Health and Safety, and Hazardous Materials

Parameter		Alternative IV-A	Alternative IV-B	Alternative IV-C
Communities/Dispersed		2	1	1
Parks or Developed RAs (campgrounds, etc.)		0	1	1
Other Sensitive Receptors (schools and daycare centers; health care facilities such as hospitals or retirement and nursing homes; cemeteries; churches)		0	1	0
Communication Sites		47	119	31
Structures Within 500 feet of the Alignment	Residential	5	8	8
	Commercial/Industrial	1	1	0
	Agricultural	0	0	0
	Outbuildings	0	0	0
Structures Within 200 feet of the Alignment	Residential	0	0	0
	Commercial/Industrial	1	0	0
	Agricultural	0	0	0
	Outbuildings	0	0	0

Alternative IV-A (Applicant Proposed and Agency Preferred)

Alternative IV-A would cross 47 communication sites and 2 communities within the analysis area in Region IV. The communities of Henderson and Boulder City, both in Nevada, are transected by the alignment and had 2010 populations of 257,729 and 15,023, respectively. There are 5 residential structures and 1 commercial/industrial structure within 500 feet of the proposed alignment. The number of structures decreases to 1 commercial/industrial structure within 200 feet of the proposed alignment. No dispersed camping or other RAs are within the analysis area. This alternative contains the most structures within 200 feet of the alignment.

Under Design Option 2, AC transmission lines instead of DC lines would be constructed. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measure **PH-1**, Project construction and operation would not be expected to substantially affect public health and safety.

Alternative IV-B

Alternative IV-B would entail crossing 119 communication sites, 1 community, 1 beach area and the Nevada State Veterans Home within the analysis area in Region IV. The Nevada State Veterans Home is located 1,690 feet from the alignment. Boulder City, Nevada is transected by the alignment and had a 2010 population of 15,023. There are 8 residential structure and 1 commercial/industrial structures within 500 feet of the proposed alignment. There are no structures within 200 feet of the proposed alignment. There are no dispersed camping areas within the analysis area. Alternative IV-B contains the most communication sites among the alternatives within the analysis area.

Under Design Option 2, AC transmission lines instead of DC lines would be constructed. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measure **PH-1**, Project construction and operation would not be expected to substantially affect public health and safety.

Alternative IV-C

Alternative IV-C would entail crossing 31 communication sites, 1 community, and 1 beach area within the analysis area in Region IV. Boulder City, Nevada, is transected by the alignment and had a 2010 population of 15,023. There are 8 residential structures within 500 feet of the proposed alignment. There are no structures within 200 feet of the proposed alignment. There is no dispersed camping or other RAs within the analysis area.

Under Design Option 2, AC transmission lines instead of DC lines would be constructed. Impacts associated with AC transmission lines are detailed in Sections 3.18.7.1 and 3.18.7.2. After considering design features, BMPs and mitigation measure **PH-1**, Project construction and operation would not be expected to substantially affect public health and safety.

Alternative Variations in Region IV

Table 3.18-17 summarizes potential impacts associated with the alternative variations in Region IV.

Table 3.18-17 Summary of Region IV Alternative Variation Impacts for Public Health and Safety and Hazardous Materials

Alternative Variation	Analysis
Marketplace Alternative Variation (Alternative IV-B)	There are no sensitive receptors, RAs or communication sites within the analysis area. Boulder City, Nevada, is transected by the alternative variation alignment. There is one commercial/industrial structure within 500 feet of the alignment. This variation would bypass one segment of Alternative IV-B. Within this segment in the analysis area is one communication site. There is no commercial/ industrial structure within 500 feet of the alignment. There would be no advantage to this alternative variation as a result of the presence of Boulder City within the analysis area.

Alternative Connectors in Region IV

Table 3.18-18 summarizes impacts and advantages associated with the alternative connectors in Region IV.

Region IV Conclusion

Alternative IV-A, Alternative IV-B, and Alternative IV-C would have similar impacts on public health and safety, with the exception that, as detailed in **Table 3.18-16**, Alternative IV-A would affect a greater number of communities than the remaining alternatives. This would increase the potential Project construction and operation health and safety risk to residential occupants. However, the successful implementation of design features, BMPs, and mitigation measure **PH-1**, would result in all of the alternatives having a relatively low impact on public health and safety.

Table 3.18-18 Summary of Region IV Alternative Connector Impacts for Public Health and Safety, Hazardous Materials

Alternative Connector	Analysis
Sunrise Mountain Alternative Connector	There are no communities, public gathering areas, RAs or communication sites within the analysis area. There are no structures within 500 feet of the alignment.
Lake Las Vegas Alternative Connector	There are no public gathering areas or RAs within the analysis area; however, there are 9 communication sites and 1 community (Henderson, Nevada). One commercial/industrial structure would be within 500 feet and 200 feet of the alignment.
Three Kids Mine Alternative Connector	There are no public gathering areas or RAs within the analysis area; however, there is 1 community (Henderson, Nevada) and 13 communication sites. There are no structures within 500 feet of the alignment.
River Mountains Alternative Connector	There are no public gathering areas or RAs within the analysis area; however, there are 2 communities (Henderson and Boulder City, Nevada) and 10 communication sites. One commercial/industrial structure would be within 500 feet of the alignment.

Table 3.18-18 Summary of Region IV Alternative Connector Impacts for Public Health and Safety, Hazardous Materials

Alternative Connector	Analysis
Railroad Pass Alternative Connector (Alternatives IV-A and IV-B)	Impacts from this alternative would be limited to 3 communities and 6 communication sites. The communities of Texas Acres, Henderson, and Boulder City, Nevada, are located within the analysis area. There are no structures within 500 feet of the alignment.

3.18.7.7 Residual Impacts

Residual impacts are impacts to a resource remaining after implementation of mitigation measures. For the proposed Project, these residual impacts include the increase in noise levels in excess of USEPA guidelines to residences near construction activities. These residual impacts would be short-term, ending once construction activities were completed in a given area.

3.18.7.8 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible commitment of resources associated with public health and safety. Impacts related to residences from construction noise would be irretrievable, but ending once construction activities were completed in a given area.

3.18.7.9 Relationship between Local Short-term Uses and Long-term Productivity

There would be relationship between local short-term uses and long-term productivity associated with public health and safety.

3.18.7.10 Impacts to Public Health and Safety from the No Action Alternative

Under the No Action Alternative, the proposed Project would not be constructed or operated. Human exposures to noise associated with the proposed Project would not occur. There would be no safety concerns from construction of the proposed Project. Existing EMF levels and health and safety considerations from transmission lines and substations in the area would continue. No hazardous materials would be used, released, or uncovered.